M.Sc. Examination, 2018
Semester-II
Statistics
Course : MSC-23
(Sample Survey)

Time : 3 Hours **Full Marks : 40**

Questions are of value as indicated in the margin

Answer **any four** questions

1. (a) Describe how the double sampling technique can be applied for the regression method of estimation of the population total. 3
   (b) Find approximate expressions for the bias and MSE of the estimator of population total under this sampling scheme. 7
2. Estimate the gain in precision if we use PPSWR sampling instead of SRSWR for estimating the population total. You should prove the necessary results. 10
3. (a) Derive expressions of the first and second order inclusion probabilities in PPSWR and SRSWR. 5
   (b) If π_i denote the first order inclusion probability in PPSWOR (n=2) sampling, then show that $\pi_i > \pi_j$ if $p_i > p_j$ where p_i denotes the normed size measure of the ith unit of the population. 5
4. (a) Distinguish between informative and non-informative sampling designs. 2
   (b) Define a homogeneous linear unbiased estimator (HLUE). Prove that among the class of HLU'E, no one exists with the uniformly minimum variance. 2+6=8
5. (a) Compare the relative merits and demerits of cluster sampling, two-stage sampling and stratified sampling with examples. 6
   (b) Derive the efficiency of cluster sampling with respect to SRS. 4
6. (a) Consider a sampling design p yielding the sample $\mathcal{S}$ and the survey data d. Prove that the data d*, derived from d through the sample set $\mathcal{S}$ * obtained from the sample $\mathcal{S}$ by ignoring the order and multiplicity of the units in $\mathcal{S}$, is a sufficient statistic. 3
   (b) Given an estimator t of the population total based on the sample $\mathcal{S}$ obtained by the sampling design p, describe the procedure of generating a new estimator having smaller variance than t. 7
7. (a) Why the randomized response technique is required? 4
   (b) Describe the related and the unrelated question method for estimating the proportion of individuals in a population addicted to drugs. 6
